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FIELD OPERATIONS MEMORANDUM

RANGER 5

FOM

JET PROPULSION LABORATORY CALIFORNIA INSTITUTE OF TECHNOLOGY

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ABBREVIATION LIST

A/C . . . . . ATTITUDE CONTROL
ADF . . . . . AERONUTRONICS DIVISION, FORD MOTOR CO.
AGC . . . . . AUTOMATIC GAIN CONTROL
AMR . . . . . ATLANTIC MISSILE RANGE
ANT. . . . . ANTENNA
A&SL . . . . . ASSEMBLY AND STERILIZATION LABORATORY
BECO . . . . . MARK I LAUNCH EVENT
CC&S . . . . . CENTRAL COMPUTER AND SEQUENCER
CMD . . . . . COMMAND
COAX . . . . . COAXIAL
COM . . . . . COMMUNICATIONS
dbm . . . . . DECIBELS, BELOW 1 MILLIWATT
D/E . . . . . DATA ENCODER
DR STA . . . . DOWN RANGE STATIONS
DSIF . . . . . DEEP SPACE INSTRUMENTATION FACILITY
EEM . . . . . ELECTRICAL EQUIVALENT MOCK-UP
ESA . . . . . EXPLOSIVE SAFE AREA
EST . . . . . EASTERN STANDARD TIME
F . . . . . FAHRENHEIT
FREQ . . . . . FREQUENCY
g . . . . . GRAVITY
G. R. . . . . GAMMA RAY
GSE . . . . . GROUND SUPPORT EQUIPMENT
h . . . . . HOUR
H. G. . . . . HIGH GAIN
J-BOX . . . . . JUNCTION BOX
J-FACT . . . . JOINT FLIGHT ACCEPTANCE COMPOSITE TEST
KOH . . . . . POTASSIUM HYDROXIDE
L/C . . . . . LUNAR CAPSULE
LCTT . . . . . LAUNCH CHECKOUT TELEMETRY TRAILER
L. G. . . . . LOW GAIN
LMSC . . . . . LOCKHEED MISSILE AND SPACE COMPANY
m . . . . . MINUTES
ma . . . . . MILLIAMPERE
mc . . . . . MEGACYCLES
M/C . . . . . MIDCOURSE
MON . . . . . MONITOR
MTR . . . . . MOTOR
N_2 . . . . . NITROGEN
P . . . . . PITCH
PSI . . . . . POUNDS/SQUARE INCH
PWR . . . . . POWER
R . . . . . ROLL
RCVR . . . . . RECEIVER
REACQ . . . . . REACQUIRE
REF . . . . . REFERENCE

ABBREVIATION LIST (Cont'd)

RF	RADIO FREQUENCY
RFI	RADIO FREQUENCY INTERFERENCE
RFT	RADIO FREQUENCY TRAILER
RTC	REAL TIME COMMAND
RWV	READ WRITE AND VERIFY
s	SECOND
SAF	SPACECRAFT ASSEMBLY FACILITIES
SC	STORED COMMANDS
SCI	SCIENCE
SECO	MARK III LAUNCH EVENT
SFA	SQUIB FIRING ASSEMBLY
SFR	SYSTEM FAILURE REPORT
S/N	SERIAL NUMBER
SRO	SUPT. OF RANGE OPERATIONS
SYNC	SYNCHRONIZE
TA	TYPE APPROVAL
TEMP	TEMPERATURE
TRANS	TRANSDUCER
VCO	VOLTAGE CONTROLLED OSCILLATOR
VECO	MARK IV LAUNCH EVENT
VRMS	VOLTS, ROOT MEAN SQUARE
XMTR	TRANSMITTER
XPNDR	TRANSPONDER
Y	YAW
ZULU	GREENWICH MEAN TIME (GMT)

I. INTRODUCTION

A. Purpose

The purpose of the FOM is to present a complete record of the JPL/AMR field operations. The FOM is essentially a comprehensive look at the JPL/AMR operations.

B. Scope

The scope of the FOM is to document the JPL/AMR activities and events from arrival of the Spacecraft at AMR through its injection into a lunar intercept trajectory.

The FOM comprises only those operations accomplished by the Test Direction Team at JPL/AMR. Deep Space Instrumentation Facility (DSIF) activities and the postinjection performance of the Spacecraft are documented, respectively, the the SFOM and other Flight Evaluation Documents*.

* Flight Evaluation Documents are listed in the Summary of Documentation Requirements for the Ranger Program EPD-11.

II. ABSTRACT

Between the arrival of the RA-5 Spacecraft on August 27, 1962, at the Atlantic Missile Range (AMR), until the Ranger RA-5 launch on October 18, 1962, all activities with respect to the Spacecraft preparation (Pre-launch checkouts and final launch countdown) took place within the anticipated operation and launch schedules. Total testing time on the Spacecraft up to launch (Pasadena & AMR) was approximately 860 hours.

The Ranger RA-5/ATLAS 215D/AGENA 6005 vehicle was launched on the first countdown of the third launch window, at 16h 59m 07.756s Zulu on October 18, 1962, from Launch Complex 12 located at the Atlantic Missile Range. The Spacecraft performed properly during the launch and data was received at AMR (DSIF-0) until loss of lock at Launch + 458 seconds.

The boost phase of the launch appeared normal with the Atlas Booster functions (Mark I, Mark III, and Mark IV) occurring on programmed schedule.

DSIF-1 and 5 acquired lock at Launch plus 1820 and 1973 seconds respectively, with tracking and data obtained through S/C inspection.

The Agena B performed properly throughout its flight. All pre-injection events occurred at near nominal times. The Spacecraft was launched into a correctible Earth/Lunar intercept trajectory, with injection occurring at Launch + 2140.24 seconds (17h 34m 48s Zulu).

The AMR tracking and computer operations were satisfactory and the computation and data transmission operations by the range were on schedule.

The primary system objectives for this flight were:

1. To determine RANGER 6 trajectory and track in real time.
2. To monitor spacecraft separation and test separation monitoring system.
3. To evaluate the functioning of the following subsystems:
   a. Power
   b. Attitude Control
   c. Central Computer and Sequencer
   d. Temperature Control

II. ABSTRACT (Continued)

e. Structures

f. Telecommunications and on-board data processing

g. Mid-Course Propulsion

h. Scientific Instrumentation

i. Lunar Capsule

The first two of the objectives were achieved when the RANGER Spacecraft was successfully separated and injected into the Earth/ Lunar intercept trajectory.

III. JPL PRE-LAUNCH OPERATIONS

A. Schedule of Operations

Scheduled operations took place as indicated in Figure 1. The period of pre-launch operations was initiated with the arrival of the Spacecraft at AMR and terminated with the successful launch on October 18, 1962.

B. Operations Summary

1. Preface. - During the period that the Spacecraft was in transit to AMR, the System Test Complex, modified for RA-5 use, was removed from Hangar AE storage and set up in the High Bay Area. By the time that the Spacecraft arrived, the complex had been cabled and was pending electrical checkout.

2. Spacecraft Arrival. - On August 27, 1962, the Ranger RA-5 Spacecraft arrived at JPL, AMR. The Spacecraft was unloaded directly into the High Bay Area allowing a more expedient method of regaining temperature and humidity stabilization within the High Bay Area.

3. Spacecraft Inspection

   a. A visual inspection was performed immediately after the Spacecraft was removed from the heat sealed bag.

   b. A series of mechanical torque checks verified that the vibration encountered in transit had not loosened the mechanical fasteners from the flight values established during the final Spacecraft button-up at SAF, Pasadena. Midcourse motor removal was deferred until after the first AMR Systems Test.

   c. Upon completion of the mechanical checks, the Spacecraft was removed from the trailer and installed directly on the system test fixture. The Scientific and Attitude Control components, removed at Pasadena, were reinstalled on the Spacecraft. Cabling with the test complex was accomplished after the Spacecraft Simulator test was completed.

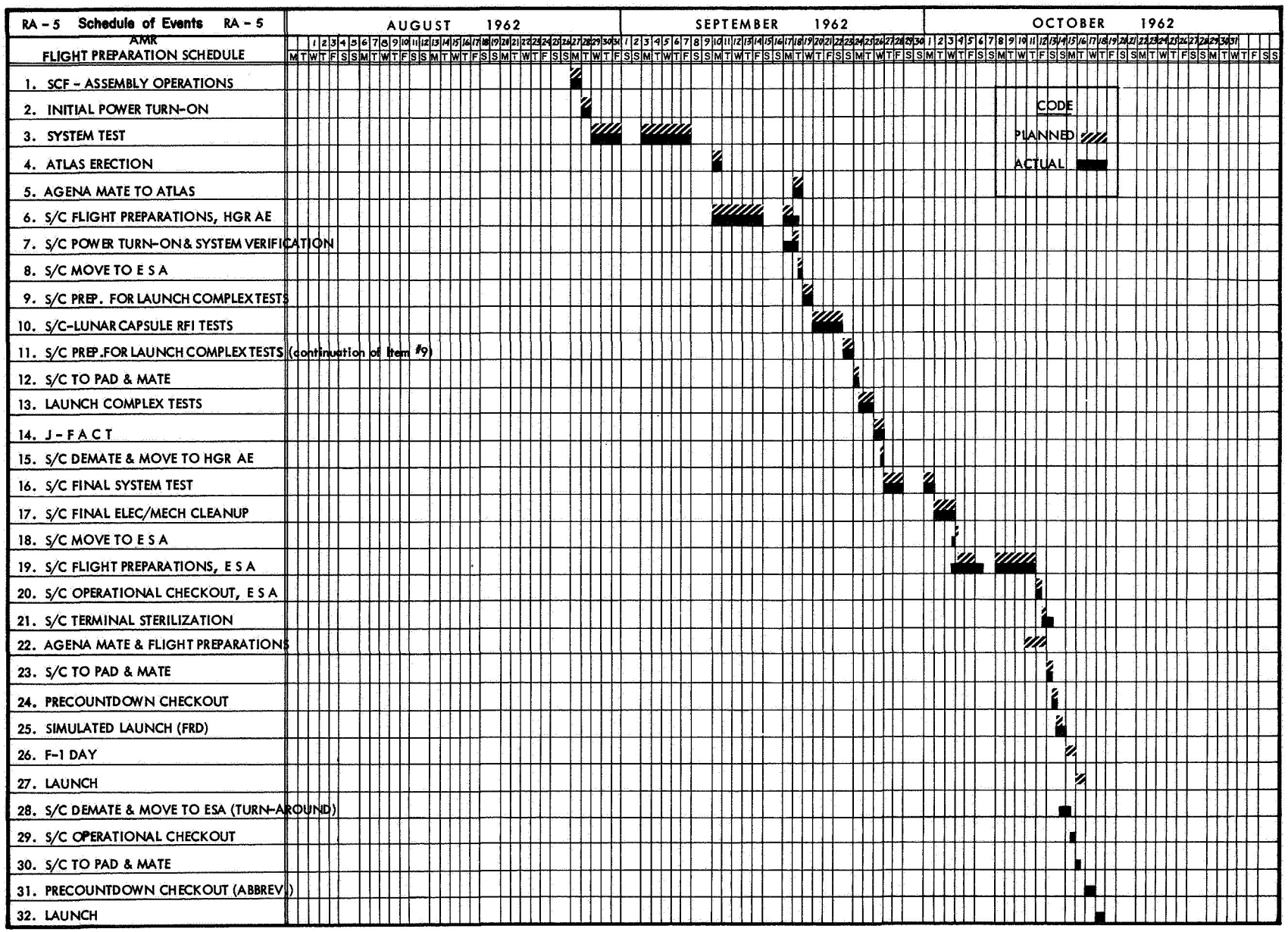

FIGURE 1. OPERATIONS SCHEDULE

4. Support Equipment Inspection

a. Flight Spares. - All flight spare modules, components, and harnesses were visually and microscopically examined prior to shelving in the stock room. No defects were observed and all were quality accepted.

b. Ground Support Equipment. - Two GSE components were damaged as a result of shipment:

1). An improperly prepared GSE Power Console, destined for blockhouse use, had a component drawer release and impact on the floor of the van.

2). The Vidicon GSE Collimator had a broken glass light source diffuser plate. Replacement of the diffuser plate and realignment of the collimator brought the equipment back to normal operation. REF: (SFR-70).

5. Ground and wiring integrity checks were performed as a parallel operation with the mechanical inspection on August 27, 1962. Ground checks of the GSE and Systems Test Area were performed and minor changes made to conform to standard grounding procedure. No ground loops were found looking back into the Spacecraft. GSE self checks were initiated immediately following the wiring integrity checks. The Spacecraft Simulator allowed a verification of systems test complex-GSE operations and ascertained that no deficiency existed that would be detrimental to the Spacecraft.

6. Initial Power Turn-On occurred on August 28, 1962, and Spacecraft subsystem verification tests were initiated. The following discrepancies were noted:

a. Central Computer and Sequencer (CC&S) encountered GSE counting problems. The input impedance presented by the preset counter caused the line amplifier GSE to oscillate. This oscillation was then picked up and counted by the preset counter. A change in the circuit impedance solved the problem.

b. Data Display photoprinter encountered coding and printout problems. These problems were partially resolved prior to systems test.

c. A complete power survey was satisfactorily accomplished.

7. Systems Test No. 6 was conducted on August 29, 1962, at AMR Hangar AE. Spacecraft configuration and difficulties encountered during test are as follows:

a. Spacecraft Flight Configuration (Exceptions)

1).	No Solar Panels		STANDARD SYSTEMS TEST CONFIGURATION
2).	No High or Low Gain Antenna		
3).	No Lunar Capsule		
4).	Non-Flight Yoke		
5).	No Pyrotechnics (Squib Simulators installed)		
6).	Radio Altimeter (T/A or EEM)		
7).	Remote Actuation Boxes installed		
8).	Gamma-Ray Boom (1A21)	S/N Mock-up	
9).	Battery (4A18)	S/N Mock-up	
10).	Vidicon Cable (9W4)	S/N Mock-up	

b. Spacecraft Problems

1), A substitute internal (flight type) battery, composed of two 12-volt automobile batteries connected in series, was used. As the current capabilities of this arrangement are limited, the Spacecraft was operated from GSE power and switched to battery for pyrotechnic events only.

2), The Spacecraft Data Encoder experienced a mode change due to scientific inverter relay switching after command RTC-6 was initiated. This deficiency was resolved prior to the next systems test. It was also noted that a Gamma-Ray Temperature Transducer (23TT1) deviated from the plotted curve (shifted 19 ohms). This transducer was replaced later in the operations.

c. GSE deficiencies noted were:

1). CC&S Preset Counter failed to allow fast counting. A design change to the line amplifier, involving the feedback circuit, was incorporated. This change was effected so that the circuitry would not be prone to oscillation. REF: (SFR-73).

2). Central Timer Remote Display failed to operate consistently due to a faulty stepper switch. Replacement of the stepper switch returned the timer to proper operation. REF: (SFR-74).

3). Data Display Photoprinter failed to operate. The failure was attributed to a loose screw shorting out one of the circuit boards. This deficiency was rectified. REF: (SFR-71). In addition, the remote display C2 unit digit "7" readout was not working and the power supply module case, for channels 8 and B2 discriminators, failed at the beginning of the test due to a defective time delay relay. Replacement of the faulty components returned the systems to normal operation.

4). Pyrotechnics events were excessively noisy on the Central Recorder tape records. This condition was resolved when the flight type battery was installed.

5). Simulated Solar Power dropped to about 13-volts after Command A-6 was set. The Spacecraft was immediately switched to external power and the systems test resumed. Later investigation indicated that a transient, resulting from the setting of the A-6 Command, caused the simulator to go into a high-current low-voltage mode of operation (no battery was present to prevent this action). See ECO 2818, P9a3) for further details.

d. The Midcourse motor was removed and given to the cognizant engineer for center-of-gravity determination and required leakage tests.

8. Attitude Control High Pressure Leak Test. - On August 31, 1962, the Spacecraft was turned over to the Attitude Control group for a high-pressure leak test. This test was conducted over a 72-hour period, other operations were suspended and the High Bay Area was closed off to all personnel not directly connected with the operations. The high-pressure leak check was completed on September 3, 1962, and the results were well within tolerance.

9. Subsystem Updating and Calibration. - The operations following the high-pressure leak test consisted of incorporating outstanding subsystem ECO's, calibration of equipments, and preparation for system test.

a. Updating operations commenced on September 4, 1962, and the following ECO's were incorporated;

1). ECO 2817 removed and modified the following power inverters:

Unit No.	Flight	Description	Spare S/N
4A3	008	Attitude Control Converter	
4A4	004	Communications Converter	005, 006
4A5	005	Command Converter	004, 006
4A6	006	CC&S Inverter	005, 009
4A7	005	Data Encoder Converter	009, 008
4A13	007	400 Cycle Inverter (See: SFR-75)	

This modification consisted of removal of overload circuitry in order to improve the in-flight reliability of the Ranger power subsystem.

2), ECO 3408 incorporated a 22 k resistor in the CC&S Central Clock , module 5A1, S/N 004 and 008, to assure better stabilization of the oscillator over the environmental temperature range.

3). ECO 2818 involved Scientific Inverter, 4A8, S/N 8, which was replaced by modified flight designated inverter, 4A8, S/N 6. Changes to this module have resulted from the erroneous mode changes encountered in the past at C=0. These mode changes were initiated by a transient (kickback) being produced by the scientific inverter relay coil. This surge was induced into the Command Decoder and CC&S mode change lines to the Data Encoder when RTC-6 (Terminal Maneuver Initiate) command turned the vidicon "ON" and caused inverter relay K2 to break and make. A resistor added in parallel with relay K2 coil reduced the energy surge associated with the relay actuation. Serial No. 2 and 8 inverters were designated as flight spares.

b. A flight type battery was received and prepared for test by the addition of the KOH electrolyte. This battery was installed on the Spacecraft after proper voltage conditions were established.

c. With the flight type battery available, it was possible to successfully complete the Pyrotechnic and Central Recorder calibrations. This was not possible during Systems Test No. 6 due to the automotive type batteries in use.

d. Data Encoder replaced Channel 4 VCO, S/N 191054, with VCO S/N 283416. This change, covered by prior failure reports, was outstanding for some time.

e. On September 5, 1962, Spacecraft power was turned on and a complete power survey conducted to verify proper operation of the modified components. The following systems were checked:

1). Modified power inverters checked out. During test it was discovered that the performance of flight module 4A13, S/N 007, was questionable (went into overload mode upon sync removal) and therefore was replaced with spare, S/N 008. REF: (SFR-75).

2). Modified CC&S Central Clock circuit checked.

3). Modified Scientific Inverters were tested with the induced surge measured on the Command Decoder mode change line at 1.2 volts peak-to-peak and on the Central Computer and Sequencer mode change line at 0.7 volt peak-to-peak. These levels were considerably below the transients which caused the erroneous mode changes. The modified module 4A8, S/N 6, was adjusted to the previously established module setting of 26.13 vrms.

f. The defective temperature transducer on Gamma-Ray Harness 9W17 S/N 18, was replaced with temperature transducer 23TT1, S/N 869. REF: (SFR-76). The cable was replaced and the boom installed on the Spacecraft. A check of conformal coating on scientific modules was conducted and it was noted that a resistor in module 23A7, S/N 108, was not coated. The proper coating was added and the module reinstalled. The gamma-ray "1" and "0" levels were calibrated with the Data Encoder on Channels 8 and V.

g. Vidicon video outputs were adjusted for proper 2-volt peak-to-peak levels.

h. Data Selector, 6A14, S/N 3, connector J1 had one pin missing. Removal of the module located the pin in the bottom of Case V. Systems Failure Report No. 87 covers the details of this problem.

i. On September 6, 1962, the following subsystem checks and calibrations were completed:

1). A recheck of the Pyrotechnic B2-2 events indicated that all pulses were satisfactory.

2). Calibration of the Solar Panel Temperature transducers with the Data Encoder and calibration of the Gamma-Ray temperature transducer channels with a Wheatstone Bridge.

10. Systems Test No. 7 was conducted on September 7, 1962, at AMR and was completed with only minor calibration deficiencies being noted. This test deviated from the normal systems test procedure when opposite Spacecraft control functions (polarities) were exercised. A satisfactory first use of the Data Display magnetic tape recorder was accomplished during this test:

a. Spacecraft Configuration

1). Standard Systems Test Configuration

10. a. Spacecraft Configuration (Cont'd)

2). Gamma-Ray Boom (1A21) S/N Mock-up

3). Battery (4A18) S/N Mock-up

4). Squib Firing Assembly (8A42) S/N 104 (Flight Spare)

b. Spacecraft Difficulties

1). Data Encoder Channel 4 VCO, 6A2, S/N 3, was down 1.5 db; this condition resulted from replacement without setting the level. Systems Failure Report No. 84 was written and the resetting of level was accomplished on September 10, 1962

2). Scientific Vidicon Channel V signal was out-of-band. This condition was corrected after systems test by adjusting the collimator light operating level with the Variac control. This control was adjusted to a final setting of 58 which allowed a 2-volt peak-to-peak signal. REF: (SFR-83.

c. The balance of the problems occurred in GSE operations. Failure Reports were written and the conditions of failure are listed below:

1). Data Display Channel V discriminator failed due to faulty output amplifier and was replaced by the spare for the balance of the test. REF: (SFR-77).

2). Data Display Photoprinter failed as a result of a shorted thermostat and was inoperative for the last half of the systems test. Replacement of the shorted thermostat and blown fuses was accomplished prior to the next period of operation. REF: (SFR-78).

3). Attitude Control exhibited an improper burn rate during the midcourse motor start and stop events. This condition was attributed to improper Spacecraft orientation (3° inclination rather than the correct procedural rate of 4.5°) and an incorrect sensitivity setting of the counter located on the GSE. This condition was corrected by checking the inclination more accurately and setting the counter sensitivity properly. REF: (SFR-79).

4). Communications had an RF power meter fail during this test. Replacement of the defective meter restored equipment to proper operation.

5). Data Display remote window readouts were improper. This condition was caused by an inoperative phase detector in the channel 3 phase-lock-loop frequency multiplier. REF: (SFR-80).

6). Data Encoder GSE Inhibit Lamp failed. REF: (SFR-81).

7). Read, Write and Verify (RWV)did not accept Command RTC-7 through the verify sub-mode (NO-GO INDICATOR ON). The trouble was attributed to the modulator although the failure cleared up later during the test. REF: (SFR-82).

11. Subsystem Calibrations were accomplished on September 10,1962 and the Data Encoder Channel 4 VCO level was successfully set and verified by running Mode I and IV spectrum analyses; additional calibrations and verifications were as follows:

a. Preparation for flight battery temperature transducer calibration was established in the Data Encoder GSE by setting up the signal conditioner at a preselected resistance value.

b. The flight solar panels were electrically interconnected with the Spacecraft and the following items checked:

1). Secondary Sun Sensors

2). Solar Cell Experiment Loop Check

3). Solar Panel Temperature Transducers

4). Shunt Zener Diodes

All components were within tolerance. A slight deviation was noted in solar panel zener diode current when checked at 29-volts; Solar Panel 4A9 checked out at 200 ma, and Solar Panel 4A10 checked out at 340-ma. This condition was anticipated and was well within tolerance.

c. The solar panels were taken outside for a check of power output. This test, made late in the day, was under relatively clear and dry conditions (Rel. humidity, 55 percent). Results are tabulated in the following entries:

4A9		S/N 14	4A10		S/N 13
E_{oc}	=	36 V	E_{oc}	=	37 V
ISC	=	2.90 amps	ISC	=	2.72 amps
Pwr	=	59 watts	Pwr	=	62 watts

12. Flight Preparations, Hangar AE

a. The Spacecraft was removed from the system test fixture and mounted on the assembly dolly. The next four days (September 11,12,13,14) were devoted to flight preparation of the Spacecraft for the move to ESA. A list of operations follows:

1). Spacecraft disassembly was completed and component inspection initiated. Flight modules were delivered to Quality Control for microscopic inspection.

2). During case harness inspection, it was noted that the Attitude Control Case Harness, 9W14, S/N 15, showed cracked insulation around connector 7A3P1. System Failure Report No. 85 covers the disposition of this problem.

3). Thermal clean-up, in accordance with the Button-Up Procedure P36R 315, was in process and paint pattern modifications were completed.

4). Microscopic inspection of all flight modules was completed and no defects in components or construction was detected.

5). Spacecraft flight preparations continued inspection noted insulation damage on the ring harness 9W1, S/N 6. A microscopic inspection verified that no conductor damage existed and a fix was incorporated. System Failure Report No. 86 covers the details of this problem.

6). The removal of connector plug 10TT1P1 from the mid-course motor harness was initiated to comply with ECO 2137. The remaining wires were isolated and taped back on the harness. This change was initially made on the RA-4 Spacecraft to eliminate the high temperature breakdown problem encountered on prior Spacecraft, that had obviated other temperature measurements. The balance of this ECO was complied with during the JPL, Pasadena, operations.

7). Torque-down of all basic hexagon (bus) members was accomplished and a major portion of the module installations completed.

8). Basic hex preparation continued with the installation of the Flight Attitude Control Nozzles. Center-of-gravity and weight of hex and components calculations were completed with the measurements comparing

favorably to those already established. Lower thermal shield installation and case build-up was completed.

9). The built-up cases were installed on the Spacecraft bus and mounting fasterers torqued to flight values. The Spacecraft was removed from the assembly dolly, installed on the System Test Fixture, and cabled to the System Test Complex. Preparations for the system power turn-on and subsystem checkout were completed.

b. On September 17,1962, Spacecraft power was turned on for the first time since the start of flight preparation and inspection. Power levels were established and subsystems were checked with no deficiencies noted. Details of this operation follow:

1). The Scientific subsystem elected to go through ESA and J-FACT operations with their flight spare gamma-ray and vidicon systems. The Pyrotechnic subsystem was not officially checked as a representative was not present at AMR; however, a check by the systems group ascertained that operations appeared normal.

2). Both Radio Altimeters, flight spare S/N 5 and flight S/N 4, mounted on their respective support structures, were installed on the Spacecraft and individually calibrated with the Data Encoder for the following operations:

a). Extend Signals

b). Power-On Signals

c). Fuzing Signals

c. On September 18,1962, a special Attitude Control Phasing check was satisfactorily completed and the mechanical build-up of the ADF flight hardware with the Spacecraft (matchmate) was conducted. Minor deficiencies were noted during matchmate, but these were considered to be readily repairable. A detailed breakdown of the problems and conditions follows:

1). The ADF flight hardware and Spacecraft matchmate was accomplished with the following items checked:

a). Retro Support Structure

b). Spin Stabilization Unit

c). Flight Altimeter ans Support Structure

2). During the inspection and installation of these components, the following discrepancies were noted:

a). Capsule Separation Sensor adjustment on the midcourse motor was improper and was corrected prior to flight.

b). Improper cable routing was noted in three areas of the retro support structure. The interference was corrected by rerouting the cables.

d. Final mechanical preparations were completed and the Spacecraft was secured to the transporter and protected by a desiccant loaded sealed reflective bag. The Spacecraft assemblage was transported to the ESA and moved into the Assembly and Sterilization Laboratory (A&SL). Upon stabilization of the A&SL environments (temperature and especially humidity), the bag was removed and the Spacecraft built-up to flight configuration for the required Agena-adapter spring constant checks.

13. Complex Preparation, October 17 through 21, 1962

a. Dummy Run Trailer

1). The outfitting of the Dummy Run Trailer was completed and the trailer moved to the ESA for support of the scheduled operation tests.

2). The Dummy Run Trailer was cabled with the Spacecraft assembly building and checked with the Spacecraft simulator.

b. Explosive Safe Area

During checkout of the ESA to RFT RF Link, it was noted that there was no signal input to the filter rack and that mixed tones were not present. A disconnected wire was reconnected and normal operations restored. A check of the land line between RFT and Hangar AE was successfully accomplished.

c. Complex 12

1). The blockhouse GSE via the umbilical cabling was interconnected with the simulator and a checkout initiated. During the check, a problem existed in the umbilical tower J-Box which was found to be due to unplugged connectors.

2). Simulator, wide-band lines, and amplifier level checks were completed. Land line amplifier levels were adjusted to 30-volts to achieve a minimum gain of 13-volts peak-to-peak at Hangar AE and DSIF-0.

3). The blockhouse power supply was received from JPL, Pasadena, and after minor modifications, was installed at Complex 12.

14. ESA Preparations for Launch Complex Tests began on September 19, 1962. Operations included:

a. Spacecraft to Agena-adapter spring constant measurements were obtained and shim requirements calculated. An abbreviated matchmate of Spacecraft, adapter, and shroud was successfully accomplished.

b. Upon completion of the simulator checks, the Spacecraft was interconnected with the Dummy Run Trailer. During initial inspection, it was noted that the Spacecraft separation connector was riveted to the wrong side of the mounting bracket, preventing a complete spin-off mate. A temporary fix was accomplished by reinstalling the connector in the correct position, and securing with screws. REF: (SFR-100). Flight riveting was accomplished at the A&SL after final systems test. With the Spacecraft interconnected with the trailer, a set of engineering measurements was manually obtained, after which an operational checkout of the Spacecraft determined that all subsystems were operating properly.

c. September 20, 1962, was spent in the adjustment of GSE, RF links, land lines, and the preliminary clocking of Lunar Capsule S/N 18. Thresholds were established for the receiver AGC with capsule off and capsule on. Shroud-on tests were held until the following day as the Coupler Sizing Recorder had failed. A Wheatstone Bridge was substituted for the Recorder.

d. On September 21, 1962, coupler sizing operations were in process for Lunar Capsule S/N 18RFI tests, when an improper shroud coupler antenna sizing pot contact occurred causing damage to the Spacecraft omni antenna. REF: (SFR-88). The following action was taken:

1). Replaced the omni antenna with flight spare S/N 6.

2). Continued coupler sizing operation after correcting Spacecraft-trailer-shroud alignment deficiencies and installing an RA-3 extension fixture over the shroud coupler.

14. d. (continued)

3). All RFI tests were re-run as previous data became invalid with omni antenna change. A dynamic phase error (DPE) method of clocking was used for basic (coarse) clocking.

e. All RFI operations were continued and the following were accomplished (See Table I for results):

1). AGC Threshold Checks.

2). Threshold Checks (coarse and fine) for S/N 18 Capsule.

3). Coupler Sizing Calibration for S/N 18 Capsule (Note: Clearance recorded at 0.390-inch).

4). Shroud-On Threshold Checks for S/N 18 Capsule.

5). Threshold Checks (coarse) for S/N 17 Capsule.

f. RFI tests were continued September 22, 1962, with Lunar Capsule S/N 17. The following tests completed the Lunar Capsule phase of operations (See Table I for results):

1). Threshold Checks (fine).

2). RF Matchmate Tests.

3). Case II Power Measurements.

4). Coupler Sizing Calibrations (Note: Final Clearance recorded at 0.425-inch).

5). Shroud-On Threshold Checks.

TABLE I

LUNAR CAPSULE RFI TESTS

DAY 62	L/C NO.	**TRANSPONDER THRESHOLDS IN DBM						L/C POS DEG
		TEST #1	TEST #2		TEST #3			
		RCVR	RCVR	REACQ	RCVR	REACQ	CMD	
9-20	18	-139	-138	-136*	--	--	--	310
9-21	18	-139	-138	--	-132	-130* -131	-122	300
9-22	17	-139	-137	-136* -137	-129	-127*	-119 -121 -123	250

* Reacquire without knowing best frequency

** SPACECRAFT CONFIGURATION

Test 1 - Electrical: RF Cable from ESA Antenna connected to Case II, 9W8J3.

Mechanical: Radio Altimeter installed. Lunar Capsule, Solar Panels, and Shroud removed.

Test 2 - Electrical: RF Cable from ESA Antenna connected to 890/960 MC Pick-Up Probe positioned near omni antenna. Lunar Capsule "ON", Frequency unknown, and rotated to position of least transponder degradation.

Mechanical: Radio Altimeter and Lunar Capsule installed. Solar Panels and Shroud removed.

Test 3 - Electrical: RF Cable from ESA Antenna connected to Agena Adapter Quick-Disconnect. Lunar Capsule "ON", Frequency known, and rotated to position of least transponder degradation.

Mechanical: Radio Altimeter, Lunar Capsule, Solar Panels, and Shroud installed.

g. Upon completion of the RFI tests on September 22, 1962, mechanical preparation was resumed:

1). Flight Capsule 25A3, S/N 17, was returned to ESA Capsule Storage. As the capsule would not meet minimum shroud-on specifications, Systems Failure Report No. 93 was issued.

2). Flight Midcourse Motor was removed and turned over to the cognizant engineers for jet vane rework requirements.

3). During installation of the flight spare midcourse motor, it was noted that the Motor Squib connector of harness 9W49, S/N 8, was rotated 180 degrees from normal mating position. Systems Failure Report No. 89 covers the details.

4). Lunar Capsule Electrical Equivalent was installed and the shroud coupler sized at 0.450-inch.

5). The Attitude Control nitrogen gas system was charged and stabilized to approximately 3300 psi.

6). The flight shroud was reinstalled and dry nitrogen purging operations commenced. Purging operations were continued during the entire Complex 12 operations. Purging pressure maintained in the shroud at 6 inches of H_2O.

15. The Spacecraft was transported to Complex 12 at 0400 EST, September 24, 1962, and was mated to the Agena by 0530 hours. Mating operations were completely successful with no interface problems encountered. Launch complex operations included.

a. An operational test, using precountdown procedure P36R 309.02, was initiated to check the Spacecraft in the Complex 12 environment. No Spacecraft deficiencies were noted; however, certain problems did occur as a result of the electrical interface and Complex 12 GSE:

1). Data Encoder noted that during test the mixed tones from the Spacecraft had insufficient amplitude (clipped signal effect) when received by the GSE located in the blockhouse. Tests isolated the problem to a defective mixed tone amplifier located in the umbilical tower J-Box. Replacement of the amplifier brought the signal back to the proper level. REF: (SFR-91).

2). A Data Encoder Mode I Indicator Light went out on the blockhouse GSE. Investigation revealed a

defective line amplifier, in the umbilical tower J-Box. When replaced, this brought the Data Encoder Mode Indicator back into normal operation. REF: (SFR-91).

3). The Blockhouse CC&S would not inhibit properly during the precountdown check. Subsequent tests revealed a higher umbilical cable impedance than originally noted. The CC&S GSE was adjusted to allow proper inhibit current level and operations were returned to normal. REF: (SFR-90).

4). Communications noted abnormal RF readings, 20 db low, were being received from the Spacecraft by the RF trailer. REF: (SFR-92). An investigation into the problem resulted in the discovery of an intermittent high-gain cable (signal level was restored after removal and reconnection). This cable was located in the Agena Forward Storage Compartment, between the quick-disconnect and the high-gain antenna pick-up probe. A recommendation had been forwarded to LMSC to replace this cable as well as the umbilical tower-to-quick-disconnect cable after completion of J-FACT. (Note: LMSC asked withdrawal of this request at a later date on the basis that the intermittent problem no longer existed and a change to a J-FACT proven system would reduce the reliability of the mission.)

b. A Dummy Run was conducted on September 25, 1962, using the J-FACT countdown procedure. The Spacecraft exhibited no problems other than the RF deficiencies noted on the prior day. The following discrepancies were logged during this test:

1). Communications noted that during the AGC threshold checks, the transponder was still in lock at minus 145 dbm.

2). Agena Cable 151A, high-gain probe to quick-disconnect, was inadvertently left disconnected from the prior days' operations. This necessitated obtaining engineering measurements from the low-gain system until a reconnection could be accomplished.

3). The RF trailer dropped lock several times during the test. This problem was attributed to a defective VCO and frequency shifter dropping two-way lock. Replacement of the VCO stabilized the system.

4). Improper temperature transducer readings were received, but anticipated, from the as yet uncalibrated spare (+) Y Jet Vane, Booster Regulator, and Earth Sensor Transducers. The flight units will be calibrated prior to final systems test.

5). As reported, the RF problem is confined to the following areas:

a). Transponder threshold not verified.

b). Low-gain Power not stable.

Further investigation of the RF coupler and coax line problem was conducted.

c. On September 26, 1962, the Joint Flight Acceptance Composite Test (J-FACT) was performed using procedure P36R 307.02-1. During the count, several holds were called but none as a result of JPL Spacecraft operations (see Table II). When the range count had reached T-18 seconds, an automatic hold was called to allow computer setting to J-FACT configuration. As the range count does not appear on the Hangar AE Central Timer (which was in use at the time), an inadvertent count continued down to T=0; however, only a 30-second gain on the range count was incurred and the umbilical cables were removed in sequence with the range count. Other problems experienced during J-FACT were:

1). The Data Display Blockhouse GSE circuit breaker failed twice during J-FACT operations. Tests indicated that a faulty electro-mechanical latch mechanism did hold at rated breaker amperage. The faulty circuit breaker was replaced. REF: (SFR-94).

2). Attitude Control Gyro jitter was observed on the blockhouse GSE as a result of cooling blanket ducts to the Spacecraft being short and too rigidly connected. An extra length of ducting eliminated this condition.

3). Communications receiver AGC exhibited a high-gain threshold of minus 143 dbm. Later investigation at Hangar AE confirmed a proper S/C condition but did not show a cause for the high threshold.

TABLE II

J-FACT SEQUENCE OF EVENTS

T-TIME	TIME GMT	TIME EST	EVENT	HOLD DURATION
T-205m	1430	0930	J-FACT start.	
T-50m	1705	1205	GE Waveguide Problem.	5m
T-5m	1755	1255	Start Built-In Hold. Hold extended due to faulty AZUSA Transponder readout. AZUSA Transponder replaced. Agena C-Band Beacon replaced due to a poor range readout (rapid fluctuations in signal strength and frequency).	1h 49m
T-3m	1946	1446	Intentional hold to exercise change of Launch Plan procedures. Count recycled to T-5m.	3m
T=0	1954	1454	Simulated lift-off.	
T+27m	2021	1521	End of test.	

4). Communications experienced an increased reading for measurement 51 (4E1) high-gain antenna power. RF leakage on the gantry to the Spacecraft power monitor was suspected as the probable cause of this condition.

16. Spacecraft Demate and Hangar AE Operations. Demate from the Agena was successfully accomplished and the Spacecraft returned to Hangar AE, High Bay Area. At 1900 hours the Spacecraft power was again turned on for a continuation of the RF checks. A summation of the activities follows:

a. Power-On threshold checks were conducted with the Spacecraft in a shroud-on configuration and operating through the umbilical plug. The low-gain system was connected through the quick-disconnect to the test transmitter.

Threshold measurements obtained were recorded at minus 140 dbm.

b. With the removal of the shroud, hardline RF measurements and Spacecraft Attitude Control nitrogen system depressurization commenced. Hardline threshold was established at (-) 141 dbm. Depressurization operations were monitored via telemetry to allow pressure transducer tracking. Depressurization was completed with approximately 1450 psi allowed to remain for systems test.

c. The Spacecraft was removed from the Agena adapter and mounted on the assembly dolly. The high-gain antenna was removed and a dummy load installed. Separation connectors and Case II coaxial cable connectors were attached. Transponder checks continued in this configuration with a minus 141 dbm threshold still existing. Consensus of opinion is that the transponder and calibrations are proper. The shift in apparent threshold is still not explained.

17. Spacecraft Preparation for Final Systems Test and Problem Investigation was conducted September 27, 1962, with the following being accomplished.

a. Operations were devoted to the preparation of the Spacecraft in as near a flight configuration as possible for the final systems test. The modified flight midcourse motor was installed for the final verification tests. Permissible flight exceptions, due to confidence attained on prior tests and checks, were:

1). Lunar Capsule and Retro Support Structure

2). Radio Altimeter System

3). Solar Panels

b. The Spacecraft was installed on the Systems Test Fixture in preparation for final tests. Spacecraft power was turned on and the following tests completed:

1). Jet Vane actuator and battery (booster regulator) temperature transducers were calibrated via telemetry.

2). Flight Battery Voltages were determined via telemetry.

3). Pressure transducers were checked and did not exhibit any deficiencies.

c. During calibration of the midcourse motor Jet Vane angles with the Data Encoder, it was noted that improper operation existed. A check was initiated to determine the cause of this condition. It was noted that a pin in the (+) X Jet Vane Actuator connector 10A5P1 (S/N 118D) (Pin C) was bent and shorten to frame. REF: (SFR-95). The pin was straightened and the connector plugged in. Normal operations were not obtained. Further investigation revealed a charred current limiting resistor in the Jet Vane Actuator Power Supply of Switching Amplifier 7A4, S/N 10. Replacement of the defective resistor returned the system to normal operation. REF: (SFR-96).

18. Final Systems Test No. 8 commenced at 0730 hours EST on September 28, 1962, and was completed successfully at 1628 hours. Minor discrepancies were noted and resolved as shown below.

a. Spacecraft Configuration

The Spacecraft was in full flight systems test configuration except as specified in paragraph 17a.

b. Spacecraft Problems:

1). Data Encoder reported a defective midcourse motor temperature transducer reading. A check was made and the problem was isolated to an improperly connected connector plug. REF: (SFR-97).

2). Science Vidicon Cover (Sun Shield) did not remain open after being manually tripped. This problem was known to exist and was corrected by increasing the spring tension. See Systems Failure Report No. 98.

c. Ground Support Equipment Problems:

1). The LCTT experienced discriminator problems which required replacement of the faulty discriminator bank.

2). Data Display kept dropping out of sync with the Data Encoder. This problem was attributed to an improper setting of the Data Display sync circuitry and the problem was resolved by GSE adjustment.

3). Attitude Control experienced difficulty in obtaining a proper accelerometer count with the GSE Counter. A new type counter was wired in and stable readings were obtained.

4). Pyro was safed and then armed in an abnormal procedural sequence. This sequence caused an erroneous SFA event No. 6 (Radio Altimeter Power On) firing indication. A check of the fuse indicated that the event did not occur. Later analysis of the records indicated that the GSE and Spacecraft operations were correct for the abnormal procedural sequence applied.

5). Data Encoder, while conducting a further review of the final systems test Central Recorder tapes, noted that the solar panel extend signal was removed during the simulated gamma-ray boom extension event. This condition apparently resulted from the screwdriver used to short the microswitch terminals to simulate gamma boom extend signals, which came in contact with the Spacecraft and allowed the 6-volt signal to be shorted to ground. Further investigation of this problem indicated that no damage resulted to the electric components involved due to the low current level and short duration of overload (approximately 20 seconds) encountered. In addition, measurements observed immediately after, and as a result of investigation, indicated that normal operation was present in this area.

19. Special Command Verification Test. - A special test was conducted to ascertain that programmed punched tape would command the Spacecraft in a predictable manner. These tapes, received from DSIF, were processed through the RWV GSE equipment. Confirmation of programmed data was visually obtained and backed up by the CC&S tape printer record. All data and indications were proper.

20. Final Flight Preparation, Hangar AE

a. The Flight Midcourse Motor was removed from the Spacecraft after systems test completion, and turned over to the cognizant engineers for pressure transducer replacement, final leak checks, and loading (fueling) operations.

b. Communications. - Spacecraft power was turned-on to complete the following AGC Threshold/Test Transmitter checks:

1). A special transponder AGC test to verify threshold measurements with a new test transmitter (S/N 9) were conducted. Threshold obtained was minus 141 dbm and comparable with the other test transmitter/ transponder calibrations.

2). AGC checks with the serial number 9 test transmitter located in the RF screen room were completed with threshold measured again at minus 141 dbm. Serial Number 3 test transmitter was determined to have excessive RF leakage, caused by a defective cable and possibly a defective modulator. The defective Serial Number 3 test transmitter was returned to JPL, Pasadena.

c. A Gamma-Ray Boom, 1A21, problem was encountered that affected the flight spares, S/N 8 and 10 and reduced the confidence level of the flight boom, S/N 7. REF: (SFR-99). This problem involved the excessive pressure leakage and the sluggish "extend action of the boom's telescoping cylinder. Disassembly of the booms indicated that as a result of heat sterilization, the lubricant had shifted from the required surfaces allowing them to become dry. It was also noted that deformation had occurred in the "O" rings. A decision was made to remove the flight electronics, intact from the flight boom and perform certain fixes to eliminate the problems encountered. The following was accomplished:

1). Critical "O" rings were replaced.

2). Required surfaces were relubricated.

3). Extension verification of boom and reassembly.

The flight electronics were reinstalled into the flight boom and electrically checked to assure normal operation. Leak checks were initiated.

d. Case III (Scientific) was opened to complete final torquing of connectors that had been loosened during calibration. The thermal switch simulator was removed and the vidicon relay was reset for launch configuration. Prior to closing the case, a connection at 9W4 was checked for proper mating. This connection was not further verified after case closure.

e. October 1 and 2 were devoted to preparation for moving the Spacecraft to the Explosive Safe Area (ESA); the following operations were performed:

1). High-Gain Antenna was installed and nested.

2). Spacecraft was transferred from the Systems Test Fixture to the Assembly Dolly.

3). High-Gain Antenna coax connections were partially completed.

4). Solar Panels were fitted and adjustments completed.

5). Loose Pyro (SFA) connectors were tied down and protective covers installed.

6). Photographs of the Gamma-Ray Boom pressure gauge were taken to determine leak rate.

f. Spacecraft configuration for shipment to ESA:

1). No Midcourse Propulsion Unit (This unit was removed from the Spacecraft immediately after system test).

2). No Solar Panels (Solar Panels were removed and shipped in their respective protective cases to the ESA Area).

3). No Lunar Capsule Components (the flight capsule components are stored in the ESA spin test area).

4). No Dummy Pin-Pullers were installed except for vidicon shade position.

5). No Omni Antenna and Boom (this component was transported to ESA in a separate container).

g. With the completion of the Hangar AE operations, the Spacecraft was sealed in a desiccant loaded aluminized bag, and then transferred to the JPL Transporter. On October 2, 1962, at approximately 1500 hours EST, the Spacecraft was transported to the Explosive Safe Area.

21. Final Flight Preparation, ESA

a. Upon arrival, the Spacecraft was removed from the JPL Transporter, moved into the assembly laboratory, and mounted on the assembly dolly. Prior to removal of the protective cover, the area environments were allowed to restabilize. With the protective cover removed, grounding straps were connected from the Spacecraft to the building frame (ground).

b. On October 3, 1962, the Spacecraft was interconnected with the Dummy Run Trailer GSE and a complete set of engineering measurements obtained. Case II low and high-gain outputs were verified on dummy load. In addition, a complete SFA no-voltage test was performed. The results of these tests indicated that no deficiencies existed in the Spacecraft. An abbreviated microswitch check was initiated to determine

that all switches were operating properly. After the test, the GSE was disconnected from the Spacecraft.

c. The vidicon cover (sun shade) problem reported on September 28, 1962, (SFR-98), and fixed by adding an additional turn to the actuating spring, failed due to a binding action which caused the spring to pull free from its retaining hole. REF: (SFR-101). A check with the cognizant engineers resulted in a new spring being shipped immediately to AMR. With the installation of the new spring, it was determined that cover actuation would not occur in a 1 g field, but it was estimated that actuation would occur in a 0.5 g field. Flight pin-puller installation and final fit of shade to vidicon was accomplished.

d. The investigation of a suspected gamma-ray boom leak was determined to have resulted from an erroneous reading obtained from the pressure monitoring photographs. Gamma-Ray Boom monitoring checks are continuing with no evidence of leakage.

e. Final Preparation of surfaces was initiated with the touch-up (painting) of coax connectors and rotary joints which had become marred during disconnect operations. The separation connector was removed (REF: SFR-100) and correctly flight riveted to the bracket. Minor GSE preparation was completed in anticipation of the hot (explosive) build-up operations.

f. Explosive build-up operations commenced October 5, 1962, with the arrival of the fueled midcourse motor from the propulsion loading area. The sequence of build-up follows:

1). Midcourse motor verification checks were completed.

2). Midcourse motor installed on Spacecraft.

3). Midcourse motor electrical connections were completed:

a). Verified capsule separation sensor operation.

b). Connected midcourse to ring and squib harnesses.

c). Verified midcourse squibs.

4). Installed Spin Motor Restraint.

5). Radio Altimeter System installed and verified.

6). Installed Retro Support Stand.

7). Gamma-Ray Boom pressure monitoring photographs were again taken.

g. On October 8, 1962, the Spacecraft battery cell voltages were measured and recorded. All readings were within tolerance.

h. Lunar Capsule and Retro Assembly were moved into the assembly laboratory and installed on the Spacecraft. During electrical checks of this system, it was noted that a problem existed at the lower Marmon clamp finger contacts. REF: (SFR-102). This condition was resolved to be improper finger contact with the capsule pads. Cleaning returned the electrical checks to normal.

i. Omni Antenna Boom installation was initiated. Test of the omni-deploy microswitch indicated a circuit reversal in that the microswitch should indicate an electrically open condition when boom is nested. Confirmation was received from the cognizant engineer that a drawing error did exist and that wiring to switch should be reversed. Wiring was modified and boom installation completed and checked. REF: (SFR-103).

j. Attitude Control N_2 system pressurization commenced with an initial pressurization to 3400 psi, with an anticipated drop to 3200 psi as the gas cooled off. Pressurization was completed with the system final pressure locked in at 3325 psi. System clean-up continued with the removal of the gas charging port and the installation of the flight needle valve and charge port lock cap. During the removal of the particle and biological gas filter assemblies, a nut was dropped into a gas bottle thermal shield. Removal of the nut entailed lowering Case II. As a result of this operation, it became necessary to retorque all nuts on the gas bottle thermal shield (worked loose during nut retrieval) and torque Case II mounting hardware after return to flight position.

k. Gear Box sterilization commenced as a parallel operation to the Attitude Control nitrogen gas pressurization and was completed October 9, 1962. Upon completion, the gear box was purged, leak tested, and pressurized to 5 psi.

l. Solar Panels were installed on the Spacecraft and electrical connections completed. An interference problem existed between the connector lock rings and screw heads used to mount the bulkhead connectors (receptacles). This problem was solved by loosening the bulkhead connector screws, locking the connector, and retightening the screws. REF: (SFR-104).

m. Completed squib harness tie-down and JPL pin-puller connections. JPL squib system verification tests, resistance and ground checks, were successfully accomplished.

n. Preliminary JPL electrical checks, including J-Box input checks, were performed. During lunar capsule system electrical tests, an open circuit condition was experienced. This condition was caused by lower Marmon clamp fingers either developing excessive resistance or indicating an open condition where continuity should exist. REF: (SFR-105).

o. The separation clamp cover and thermal shield installation was completed without incident. A post verification of thermal shield installation and an electrical verification of finger contact, squib, and retro condition was successfully accomplished.

p. Spacecraft weight determination and center-of-gravity adjustments were performed in accordance with Procedure P36R 120.00 on October 10, 1962. Resultant measurements verified the accuracy of the prior center-of-gravity measurements (CG had not changed in excess of 0.008 inch from previously established data).

q. The placement of the rubber shield and bracket on the Spacecraft earth sensor was accomplished and each cavity of the adapter was checked for foreign matter. Electrical checks of the adapter verified that the umbilical cable and connector were electrically correct and that adapter wiring was continuous. During the electrical check, a JPL cable used to adapt the Spacecraft Simulator failed due to a broken wire. As the failed electrical connection prevented the checking of the CC&S panel relay holding current, a replacement cable was immediately installed.

r. Spacecraft-Adapter mating was accomplished, with care exercised to assure the proper positioning of the earth sensor rubber shield as it slipped into the adapter. After this mating, the shroud coupler sizing operation was conducted. Coupler size, with serial number 18 Lunar Capsule installed, was midband at 0.430 inches and the spike was centered within 0.050 of an inch within the coupler.

s. Upon completion of the coupler sizing operations, the shroud was removed and the Spacecraft prepared for the RFI tests scheduled for October 11, 1962. RF connections were completed in the following areas:

s. (Continued)

1). High-Gain Antenna coax connections.

2). Low-Gain Feed to ESA Roof Antenna.

3). Insertion Loss Cable installed on Lower Omni Connections.

4). Quick-Disconnect (LMSC) installed.

Shroud was reinstalled ready for RFI tests scheduled for the next day.

22. Spacecraft - Capsule Insertion Loss and RFI Tests

a. On October 11, 1962, prior to the GSE - Spacecraft electrical interconnect, the following checks were performed:

1). Squib Firing Assembly checked for SAFE condition.

2). GSE interconnecting, self-tests, and Simulator checks.

3). RF insertion loss tests, with shroud on, were favorably conducted.

b. At 0738 hours EST the Spacecraft area was cleared and power turned-on. A set of engineering measurements were obtained and the RFI tests initiated. While conducting RFI tests with RFT, it was noted that their threshold measurement was (-) 139 dbm, with the telemetry measurements indicating (-) 137 dbm. This deviation was considered sufficient to warrant installation of a back-up test transmitter (obtained from STC) in the ESA area motor generator room. Results of these tests are contained in Table III.

c. During the Command Decoder checks it was noted that the LCTT could not lock on the RWV receiver. As the RFT had command (RWV) back-up ability, it was elected to use their facilities to send the necessary RTC-0 and SC-6 commands.

TABLE III

FINAL CAPSULE - SPACECRAFT RFI TEST

SEQ	TEST XMTR	COAX CONNECTION POINT	FREQ	CAPSULE ELEC	SHROUD COND	THRESHOLD (DBM) LOCKED	UNLOCK
1	RFT	Case II - 9W8J3	890	ON	OFF	(-)139	(-)140
2	ESA	Case II - 9W8J3	890	ON	OFF	(-)137	(-)138
3	ESA	Stoddard Dipole	890	ON	OFF	(-)137	(-)138
4	RFT	Stoddard Dipole	890	ON	OFF	(-)137	(-)138
5	RFT	Quick-Disconnect	890	ON	ON	(-)127	(-)128
6	ESA	Quick-Disconnect	890	ON	ON	(-)129	(-)130
7*	RFT**	Quick-Disconnect	SC-6	ON	ON	(-)117	------

* Two tests were conducted on the sequence 7 Command Decoder thresholds, one at full power and the other at reduced power. Both commands passed at (-) 117 dbm thresholds.

** RFT Command Capability.

d. Upon completion of the RFI tests, the shroud was removed and mechanical preparations resumed with:

1). Antenna snubbers set.

2). Installed IMSC spin-off squibs.

3). Completed black paint touch-up.

4). Completed semi-final thermal surface clean-up.

5). Safety-wired final coax connections, Case II high and low-gain connections.

e. Attitude Control had monitored system gas pressures via telemetry with the following readings being noted:

1). 3365 psi at 73 degrees F at 0830 hours EST.

2). 3425 psi at 81.5 degrees F at 1445 hours EST.

f. Final electrical connections and tests were conducted on October 11 and 12, 1962.

23. Final Flight Preparation Operational Tests and Sterilization, ESA

a. On October 12, 1962, final hardware removal operations were completed and walk-around inspections were conducted by the cognizant departments. Operations occurring during this period included:

1). Removal of the Gamma-Ray Boom latch.

2). Removal of protective covers from the Attitude Control nozzles, nozzle solder headers, and primary and secondary sun sensors.

3). Verification that all nozzles, headers, and sun sensors were free from foreign matter.

4). Removal of primary sun sensor bracket, high-gain antenna tie strings, solar panel protective pads, earth sensor protective plug, and case hinge screws.

b. LMSC prepared and installed shroud to adapter. During electrical checkout of the shroud, it was noted that a separation pot was in an open condition. As this is only one of three such units, it was elected by LMSC to fly in this condition. NOTE: The defective separation pot was replaced during the October 14, 15, and 16 Spacecraft communications rework operations and tests.

c. An operational check determined that the Spacecraft was ready for transfer to Complex 12 upon completion of the Terminal Sterilization.

d. Terminal Sterilization was initiated on October 12 and purging operations commenced October 13, 1962, and were maintained throughout the move to Complex 12.

24. Spacecraft to Pad and Agena Mate

a. The Spacecraft was transported to Complex 12 at 0430 EST and mated to the Agena by 0630 hours. Mating operations were completely successful with no interface problems encountered.

b. An operational test was initiated to check the compatibility of the flight ready Spacecraft to the Agena interface and Complex 12 environment. The Spacecraft functioned properly with problems limited to the GSE:

24. b. (Continued)

1). As a result of the J-FACT airconditioning duct problems (gyro jitter), a new duct had been prepared by LMSC for this test. The installation of this duct to the forward storage compartment consumed a considerable amount of time, thus delaying the Spacecraft operational start.

2). Additional delays were experienced in the following areas:

a). The coax hat coupler cable installation was held pending arrival of a LMSC outside cable installer.

b). Special power test equipment had to be hand-carried up the gantry stairs due to a failure of both elevators.

c). Access holes in the Agena Adapter were not covered with flight covers until 0930 EST. This requirement was necessary to assure validity of RF measurements.

d). The hat coupler was taped to the Agena in an effort to prevent condensate from soaking into the sponge rubber gasket and changing the RF characteristics at the coupler.

3). Data Display mechanical printer in the blockhouse GSE failed and was returned to Hangar AE for repairs. REF: (SFR-108).

4). LCTT reported a Channel 3 discriminator failure. Replacement of the defective unit returned the system to normal operation.

25. Flight Readiness Demonstration (Simulated Launch)

The simulated launch took place on October 14, 1962, with the countdown starting at 1030 hours EST. This test ran exceptionally well up to T-33 minutes when an abrupt loss of RF power placed the Spacecraft in a failure mode. The test was continued to allow the other participating systems to complete their portions of the countdown and allow a more thorough evaluation of the RF problem. A sequence of significant events are contained in Table IV. Problems encountered during test were:

25. (Continued)

a. The LCTT could not lock-on the Hangar AE RWV receiver. It was elected to use the emergency back-up command capability of the RF trailer. A further investigation indicated this problem to be procedural rather than a deficiency of the RWV GSE. REF: (SFR-107).

b. Data Display in Hangar AE experienced a photoprinter failure and the blockhouse equipment was requested to back-up the requirement. Resetting of levels brought the photoprinter back into use for the remainder of the test. REF: (SFR-108). A malfunctioned mechanical printer was replaced by a spare brought in from JPL, Pasadena.

c. The CC&S blockhouse equipment indicated a NO-GO condition after a clear sequence was initiated and continued in this operational mode each time the clear was initiated. Recycle times were plotted and the cognizant engineer determined the problem existed due to rapid actuation of controls and possible higher control currents than normal. Continued tests at a slower rate of actuation did not repeat this failure. REF: (SFR-106).

d. RFT reported a 50 db drop on the 960 mc signal. A telemetry reading on 4E1 verified the 50 db power loss. Further evaluation and tests indicated no power at the cathode of the 1/4-watt driver cavity. The 960 mc power level had dropped instantaneously although the modulator was still operating at a very weak signal level. System Failure Report No. 110 was written to cover this failure. The failed transponder was hand-carried back to Pasadena for a more complete evaluation. Evaluation indicated that the 1/4-watt cavity had failed as a result of a piece of metal, within the cavity, shorting out the system.

e. The Data Display in the hangar lost the remote windows temporarily as a result of a power failure caused by a blown fuse. REF: (SFR-109).

TABLE IV

FLIGHT READINESS DEMONSTRATION

(SIMULATED LAUNCH)

GMT	T-Time	Event
1530	T-205m	Started Spacecraft countdown.
1535	T-200m	Spacecraft power ON.

TABLE IV (Cont'd)

GMT	T-Time	Event
1556	T-179m	Launch vehicle count running slightly behind time because the Range was not up at T-300 minutes to provide telemetry and beacon readout.
1637	T-138m	Preparing to transmit commands by emergency mode.
1715	T-100m	Starting service tower removal. (Thirty minutes behind schedule because of difficulties in raising 11th deck.)
1725	T-90m	Spacecraft frequencies: A. 960.040143 @ 1722Z B. 890.049030 @ 1718Z C. 960.052862 @ 1720Z Case II temperature: 79°F @ 1707Z
1738	T-77m	Service tower secured in maintenance area.
1755	T-60m	Ready Reports: Spacecraft: GO Vehicle: GO Range: GO
1815	T-40m	Spacecraft frequencies: A. 960.040202 @ 1801Z B. 890.049000 @ 1757Z C. 960.052892 @ 1759Z D. 890.052300 @ 1814Z Case II temperature: 80.5°F @ 1757Z
1821	T-34m	RF Trailer dropped lock momentarily.
1822	T-33m	RFT reports severe drop in signal level.
		Central Recorder reports increase in amplitude on Channels 5 and 6.
		Switched back to hardline - RFT out of sync.
		Hi-gain and low-gain antenna power - both out.
1825	T-30m	RFT lost lock again - re-running sync checks.
1827	T-28m	4E1 indicates no hi-gain power.
		RFT reports 50 db loss on hi-gain.

TABLE IV (Cont'd)

GMT	T-Time	Event
1827	T-28m (Cont'd)	System voltage and current: 23.2-volts 4.7-amps
1828	T-27m	Lunar Capsule reports their signal level is at same level as it normally is with a Spacecraft power off condition, higher than it is with Spacecraft power on. Will probably have to replace transponder.
1835	T-20m	Will continue test with Spacecraft in failed condition.
1842	T-13m	Have partial drive into 1/4-watt cavity - there is some 960 mc output but it is way down.
1843	T-12m	Case II temperature: 80.5°F @ 1831Z. GMT of Rate 4-9 sync pulse end: 287d 18h 24m 40s.
1850	T-5m	Start BIH. (Expected 5-minute duration.) Launch Plan: 16 Delta Ready Reports: Spacecraft: Qualified GO Vehicle: GO Range: GO
1855	T-5m	Resume countdown.
1900	T-18s	Termination of test.
1902	-----	Spacecraft to external power. Spacecraft power OFF.

26. Emergency Demate and Turn Around Operations

Upon completion of the flight readiness demonstration, the cognizant complex personnel were alerted to the immediate Spacecraft removal requirement. An expedited gantry return, Spacecraft demate from Agena, and pickup by JPL personnel at the base of the gantry was completed by 1700 EST. The Spacecraft was dispatched to the ESA and upon arrival (1900 EST), was immediately moved into the Assembly and Sterilization

Laboratory. As a parallel operation, GSE required to verify Spacecraft after build-up, was removed from Hangar AE and transported to the ESA and set up in the motor-generator room. Area environmental stabilization, GSE cabling and checkout, Spacecraft interconnection, and final Spacecraft preparation were accomplished for a power turn-on at 2110 EST. A brief log of events for October 14, 15, and 16, 1962, are contained in Table V.

TABLE V

OPERATIONAL EVENTS - OCTOBER 14, 15, 16, 1962

DATE (Oct)	HOURS-EST	OPERATION
14	2100-2400	Evaluation test of the failed transponder (2A1, SN 006) (SFR No. 110) while still on the Spacecraft.
15	2400-0300	Flight preparation of the spare transponder (2A1, SN 16) (SFR No. 111).
15	0300-1845	Installation and calibration of spare transponder (2A1, SN 16). Included calibration of channels 4E0, 4E1, 4E2, 4E4, $3D_2 2$, 4E5, $3D_2 0$, 4E3, 4J3, and 4H3. Also performed spectrum analysis, 1 point AGC checks, and Capsule RFI tests. During the course of these tests, Communications Converter (4A1, SN 004) was overloaded and failed. Later checks indicated this failure due to a coax cable with conductor shorted to ground (SFR No. 112).
15-16	2130-0400	Final mechanical, electrical, and pyro operations and checks.
16	0430-0820	Final ESA operational test.
16	0820-0900	Transit prep and move to Complex 12.

27. Spacecraft-Complex 12 Operational Tests. - The Spacecraft was remated to the Agena-B on October 16, 1962. Operational tests were initiated to check complex compatibility and verify the flight readiness of the Spacecraft. Launch, initially rescheduled for October 17, was postponed until October 18, 1962, due to an unfavorable weather prediction. The following paragraphs briefly describe the final days of the RA-5 Spacecraft at launch complex 12:

a. On October 16, 1962, the Spacecraft-Agena mechanical and electrical interface was completed. At 1300 hours EST an operational test of the Spacecraft was initiated. This test stressed communication functional checks and engineering measurements. The engineering measurements were relayed to the evaluation team throughout the test. Problems encountered were:

1). During power measurements at the umbilical cable boom face connector, it was noted that measurements varied from (+) 17 to 25 db. Continued investigation revealed an intermittent connection of the boom cable at the quick-disconnect. This condition was caused by a receptacle mounting screw extending sufficiently to prevent a complete electrical-mechanical mate. Removal of a washer beneath the offending screw head corrected the problem and allowed proper mate to be achieved.

2). Data Display in Hangar AE reported a mechanical printer failure. Systems Failure Report No. 108 incorporated this deficiency. Immediate repairs were initiated and the printer was readied for the following days test.

Upon completion of this test, an unconditional Spacecraft GO was received from all members of the evaluation team.

b. On October 17, 1962, a brief operational test was again conducted to verify the flight readiness of the Spacecraft. This test commenced at 1100 hours EST and was completed by 1330 hours. Again communication functions and engineering measurements were stressed. All members of the evaluation team were satisfied with the results obtained and specified that their systems were ready for the final launch countdown. Terminal Sterilization of the Spacecraft was initiated this same day and was completed, with purging, early the following morning. The sterilization equipment had been moved to the 14th floor of the gantry to support the originally conceived demate-remate transponder change planned to meet the original launch date. As a parallel function , power completed charging operations on the Spacecraft battery.

IV. LAUNCH OPERATIONS (October 18, 1962)

A. The launch countdown proceeded normally, with HOLDS called at the following times:

1). Hold called at T-245 minutes, duration 60 minutes, to replace power supply and voltage regulator in Agena telemetry.

2). Hold called at T-60 minutes, duration 10 minutes, to establish weather conditions, vehicle status, and launch window requirements.

3) Hold called at T-25 minutes, duration 21 minutes, to evaluate wind conditions and complete LOX tanking in the ATLAS.

4). Hold called at T-5 minutes, duration 5 minutes, to set up LAUNCH PLAN 18C.

There were no holds called due to the Spacecraft.

B. The Ranger RA-5/ATLAS 214D/AGENA 6005 vehicle was launched during the first countdown, meeting the third firing window at 16h 59m 07.756s Zulu on October 18, 1962. Launch was accomplished from Complex 12 at the Atlantic Missile Range.

During the boost phase of the launch, the ATLAS vehicle performed in the following manner:

1). Mark I Launch Event - Nominal

2). Mark III Launch Event - Nominal

3). Mark IV Launch Event - Initiated by Timer

AGENA performance was well within tolerances, and the following events were observed:

1). Mark V Launch Event occurred at Launch + 290.19 seconds (17h 03m 57.95s Zulu).

2). Mark VI Launch Event occurred at Launch + 293.34 seconds. (17h 04m 01.1s Zulu).

3). Mark VII Launch Event occurred at Launch + 340.16 seconds 17h 04m 47.92s Zulu).

4). Mark IX Launch Event occurred at Launch + 2050.24 seconds (17h 33m 18s Zulu).

5). Mark XII Launch Event occurred at Launch + 2297.74 seconds (17h 37m 25.5s Zulu).

IV. LAUNCH OPERATIONS (Cont'd)

6). Mark XIII Launch Event occurred at Launch + 2687.04 seconds (17h 43m 54.8s Zulu).

C. The AMR tracking and computer operation was good.

V. RA-5 SPACECRAFT FLIGHT CONFIGURATION (Serialization of Components)

The following list of components represents the RA-5 flight configuration at time of launch on October 18, 1962:

NOMENCLATURE	UNIT NO.	SERIAL NO.	NOMENCLATURE	UNIT NO.	SERIAL NO.
Basic Hexagonal Bus.	1A1	17	Lower Thermal Shield.	1A23	NO/SN
Solar Panel Support.	1A2	NO/SN	M/C Motor Jet Vane(+Y).	1A24	3
Solar Panel Support.	1A3	NO/SN	M/C Motor Jet Vane(-Y).	1A25	4
Solar Panel Support.	1A4	NO/SN	M/C Motor Jet Vane(+X).	1A26	1
Solar Panel Support.	1A5	NO/SN	M/C Motor Jet Vane(-X).	1A27	2
Hi-Gain Antenna Yoke.	1A6	3	Omni Antenna Adapter.	1A28	5
Earth Sensor Sun Shade.	1A7	12	Shroud Bumpers.	1A29	NO/SN
Vidicon Cover.	1A8	006	Ring Harness Tray.	1A30	NO/SN
Solar Panel Actuator.	1A9	69	Nitrogen Bottle Mounts.	1A31	NO/SN
Solar Panel Actuator.	1A10	70	G.R. Cable Dispenser.	1A32	5
Case I Pan.	1A11	315E	Transponder.	2A1	16
Case II Pan.	1A12	8417	RF Driver.	2A2	39-1
Case III Pan.	1A13	101	RF Amplifier(Hi-Gain).	2A3	30-2
Case IV Pan.	1A14	114	Diplexer.	2A4	13
Case V Pan.	1A15	110	RF Amplifier(Lo-Gain).	2A5	27-1
Case VI Pan.	1A16	101	Antenna Monitor, Hi-Gain.	2A6	16
Vidicon Support.	1A17	NO/SN	Antenna Monitor, Lo-Gain.	2A7	16
Omni Antenna Boom.	1A18	10	Antenna & Feed, Hi-Gain.	2A8	18 & 15
Omni Boom Actuator.	1A19	8	Antenna, Lo-Gain.	2A9	9
Omni Boom Clamp.	1A20	10	Transfer Switch	2A10	16
Gamma-Ray Boom and Sphere.	1A21	7	Rotary Joint.	2A20	11
Upper Thermal Shield.	1A22	NO/SN			

V. RA-5 SPACECRAFT FLIGHT CONFIGURATION (Cont'd)

NOMENCLATURE	UNIT NO.	SERIAL NO.
Transponder Temp Transducer.	2TT1	639
Command Detector.	3A1	4
Command Decoder.	3A2	9
Power Switching & Logic.	4A1	008
Boost Regulator.	4A2	005
A/C Converter.	4A3	008
Communications Converter.	4A4	005
Command Converter.	4A5	005
CC&S Converter.	4A6	006
Data Encoder Converter.	4A7	005
Scientific Inverter.	4A8	006
Solar Panel.	4A9AB	14
Solar Panel.	4A10DE	13
Power Sync Supply.	4A12	004
400 CPS 1 Phase Inverter.	4A13	008
400 CPS 3 Phase Inverter.	4A14	009
Battery.	4A15	101
Solar Panel Evaluator.	4A16	14
4A15 Temp Trans (a).	4TT1	831
4A2 Temp Trans.	4TT3	395
4A3 Temp Trans.	4TT4	278
4A15 Temp Trans (b).	4TT6	4
4A10 Temp Trans(Front).	4TT7	751
4A10 Temp Trans(Rear).	4TT8	767
4A9 Temp Trans(Front).	4TT9	816
4A9 Temp Trans(Rear).	4TT10	818
4A1 Temp Trans.	4TT11	826
4A7 Temp Trans.	4TT12	392
Central Clock.	5A1	004
Launch Counter.	5A2	004
Maneuver Clock.	5A3	004
Maneuver Duration.	5A4	004
Maneuver Output.	5A5	004
Accelerometer Integrator.	5A6	004
Input Decoder.	5A7	004
Pulse Sequencer.	5A8	004
Transformer-Rectifier.	5A9	004
VCO Module I.	6A1	3
VCO Module II.	6A2	3
VCO Module III.	6A3	2
VCO Channel 2.		16209
VCO Channel 3.		191053
VCO Channel 4.		283416
VCO Channel 5.		191057

V. RA-5 SPACECRAFT FLIGHT CONFIGURATION (Cont'd)

NOMENCLATURE	UNIT NO.	SERIAL NO.	NOMENCLATURE	UNIT NO.	SERIAL NO.
VCO Channel 6.		17588	Sun Sensor(Support F).	7A13F	APL
Binary Oscillator.	6A4	3	Sun Sensor (4A9).	7A14	5BY
Commutator I.	6A5	10	Sun Sensor (4A10).	7A15	5BP
Commutator II.	6A6	8	Jet & Valve (Yaw).	7A16E	62,79
Commutator III.	6A7	3	Jet & Valve (Yaw).	7A17A	52,68
Commutator IV.	6A8	3	N_2 Tank Pressure Trans.	7A18	8438
Signal Conditioner.	6A9	3	Accelerometer.	7A21	10
DC Amplifier.	6A10	2	N_2 Pressure Bottle.	7A22B	242
Event Coder.	6A11	5	N_2 Pressure Bottle.	7A23C	246
Temp. Bridge I.	6A12	3	N_2 Pressure Bottle.	7A24E	243
Temp. Bridge II.	6A13	3	N_2 Pressure Regulator.	7A25	4
Data Selector.	6A14	3	N_2 Pressure Bottle.	7A26F	245
Gyro & Capacitors.	7A1	005	7A18 Temp Trans.	7TT1	817
Gyro Electronics.	7A2	10	7A9 Temp Trans.	7TT2	528
Ant. Drive Electronics.	7A3	10	7A10 Temp Trans.	7TT3	739
Switching Amplifier.	7A4	10	7A11 Temp Trans.	7TT4	352
Autopilot Electronics.	7A5	3	7A13 Temp Trans.	7TT5	351
Jet & Valve (P&R).	7A6C	83,89,98	7A12 Temp Trans.	7TT6	827
Jet & Valve (P&R).	7A7F	45,54,72	Gyro Temp Trans.	7TT7	429
Antenna Motor/Housing.	7A8C	15	N_2 Temp Trans.	7TT8	832
Earth Sensor.	7A9C	35	Squib Firing Assembly.	8A42	103
Sun Sensor(Support B).	7A10B	AYR-1	4A9 Unfold Sensor.	8A69	NO/SN
Sun Sensor(Support C).	7A11C	APR	4A10 Unfold Sensor.	8A70	NO/SN
Sun Sensor(Support E).	7A12E	AYL-1	1A21 Extend Sensor	8A71	NO/SN

V. RA-5 SPACECRAFT FLIGHT CONFIGURATION (Cont'd)

NOMENCLATURE	UNIT NO.	SERIAL NO.	NOMENCLATURE	UNIT NO.	SERIAL NO.
2A9 Deploy Sensor.	8A72	NO/SN	M/C Motor Harness.	9W3	14
Separation Sensor.	8A73	NO/SN	Vidicon Cable.	9W4	15
4A9 Unfold Squib.	8SQ1A	731	Earth Sensor Cable.	9W5	18
4A9 Unfold Squib.	8SQ2B	736	Lo-Gain Antenna Coax.	9W8	2
4A10 Unfold Squib.	8SQ3D	725	Rotary Joint Coax.	9W9	1
4A10 Unfold Squib.	8SQ4E	738	Hi-Gain Antenna Coax.	9W10	1
2A9 Deploy Squib.	8SQ5	679	Case I Harness (CC&S).	9W11	2
1A21 Extend Squib.	8SQ7	655	Case II Harness (COM).	9W12	16
Altimeter Deploy (F).	8SQ13	778	Case III Harness(SCI).	9W13	10
21A1 Vidicon Cover.	8SQ14	773	Case IV Harness (A/C).	9W14	15
4A9 Unfold Squib.	8SQ21A	731	Case V Harness (D/E).	9W15	8
4A9 Unfold Squib.	8SQ22B	736	Case VI Harness (PWR).	9W16	14
4A10 Unfold Squib.	8SQ23D	725	Gamma Ray Boom Harness.	9W17	18
4A10 Unfold Squib.	8SQ24E	738	Case I Harness (CMD).	9W18	17
2A9 Deploy Squib.	8SQ25	679	M/C Transducer Harness.	9W19	7
1A21 Extend Squib.	8SQ27	655	G.R. #1 Case Harness.	9W20	9
Altimeter Deploy (M).	8SQ33	739	G.R. #2 Case Harness.	9W21	18
21A1 Vidicon Cover.	8SQ34	773	Diplexer to Omni Coax.	9W23	NO/SN
N_2 Valve Open (M/C).	8SQ35	2912	H.G. Ant. Mon./Rotary.	9W24	NO/SN
N_2 Valve Shut (M/C).	8SQ37	2983	Cavities/Switch Coax.	9W25	NO/SN
Fuel Valve Open (M/C).	8SQ39	2908	H.G. Ant. Mon./Switch.	9W26	NO/SN
Fuel Valve Shut(M/C).	8SQ42	2991	Cavity/L.G. Mon. Coax.	9W27	NO/SN
Oxidizer Valve Open.	8SQ44	2913	Cavity/H.G. Mon. Coax.	9W28	NO/SN
Ring Harness.	9W1	6	Cavity/Xpndr Coax.	9W29	NO/SN

V. RA-5 SPACECRAFT FLIGHT CONFIGURATION (Cont'd)

NOMENCLATURE	UNIT NO.	SERIAL NO.
Xpndr to Diplexer Coax.	9W30	NO/SN
Diplexer to L.G. Mon.	9W31	NO/SN
L.G. Mon. to Switch Coax	9W32	NO/SN
H.V. Pwr Supply Harness	9W33	8
Case V to Omni Coax #II	9W34	8
M/C Mtr Ignition Harness.	9W49	6
L.G. Boom Squib Harness.	9W50	2
Main Squib Harness.	9W51	3
Fuel Valve-M/C Motor.	10A1	9102451
Helium Valve-M/C Motor.	10A2	9102608
+Y Yaw Actuator.	10A3	107-D
-Y Yaw Actuator.	10A4	90-C
+X Pitch Actuator.	10A5	118-D
-X Pitch Actuator.	10A6	115-D
Oxidizer Valve/Tank.	10A7	9102578
Fuel Tank Press Trans.	10A8	4961
M/C N_2 Tank Press Trans	10A9	8509
Main Frame/Structure.	10A10	5
M/C N_2 Tank.	10A11	1045
M/C N_2 Press Regulator.	10A12	17-D
Fuel Tank Assembly.	10A13	K-Z35
Engine & Catalyst.	10A14	NO/SN
Engine Wall Temp Trans.	10TT1	N/A
Fuel Tank Temp Trans.	10TT2	600
Helium Tank Temp Trans.	10TT3	608
(-) Yaw Temp Trans.	10TT4	251
(+) Yaw Temp Trans.	10TT5	252
Support Temp Trans.	11TT1	825
Vidicon & Telescope Assy.	21A1	007
Vidicon Electronics.	21A2	007
Vidicon TR Power Supply	21A3	007
Gamma Ray Detector.	23A1	14
Detector Power Supply.	23A2	008
Gamma Ray Decoder.	23A3	108
Gamma Ray Memory.	23A4	108
Gamma Ray Programmer.	23A5	108
Gamma Ray Converter.	23A6	108
Analyzer TR Power Supply.	23A7	108
Thermal Shield Sphere.	23A8	7
Detector Temp Trans.	23TT1	869
Radio Altimeter.	24A1	F-4
Altimeter Support.	24A2	105
Altimeter J-Box.	24A3	105
Thermal Switch.	24A4	F-4
Capsule Support.	25A1	104
Retro Motor.	25A2	208

V. RA-5 SPACECRAFT FLIGHT CONFIGURATION (Cont'd)

NOMENCLATURE	UNIT NO.	SERIAL NO.
Payload Sphere	25A3	018
Spin Motor	25A4	307
Power Sequencer	25A6	FP-1
Vibration Dampers (12)	25A7	*

* 117, 118, 119, 121, 146, 174, 177, 180, 183, 186, 194

NOMENCLATURE	UNIT NO.	SERIAL NO.
Bus Separation Clamp.	25A8	102
Payload Separation Clamp.	25A9	105
Thermal Shield.	25A10	6
Scientific Commutator.	29A1	005
Thermal Switch (29A1).	29A2	005

VI LAUNCH COUNTDOWN LOG

TEST: 5050 AMR

DATE: OCTOBER 18, 1962

TIME		EVENT
GMT	T-TIME	
1023	T-300m	Started Range countdown. Established communications with JPL/ Pasadena. Weather report at 0500 EST (valid from 1100 EST to 1400 EST) Cloud Coverage: Cumulus .2, 2,000' to 6,000' Alto Cumulus .1, 2,000' to 15,000' Cirrus .1, 12,000' to 14,000' .6, 23,000' to 30,000' Precipitation: None Visibility: 10 miles Surface Winds: NW (320°), 13 knots steady with gusts to 22 knots
1053	T-270	Both leased lines out.
1059	T-264	Both leased lines back in.
1118	T-245	Holding for replacement of power supply in Agena telemetry system. Expected duration - 15 minutes.
1130	T-245	Range status: All stations in a "green" condition with exception of 4101 computer on the Twin Falls Victory. SRO reports that this may be ready by launch.
1133	T-245	Hold extended 15 minutes.
1147	T-245	Hold extended additional 15 minutes. AGENA power supply replaced but a readout from telemetry still could not be obtained.

VI LAUNCH COUNTDOWN LOG (Cont'd)

TIME		EVENT
GMT	T-TIME	
1200	T-245	Estimate 15 minutes more in this hold.
1209	T-245	Bad voltage regulator discovered. Replacement of the regulator cleared the trouble.
1218	T-245	Resumed count. Running RSC checks.
1225	T-238	T-12-Hour Weather Report - GO Bending Moment: 43% Usable Control: 37% Total Effect: 64%
1229	T-234	RSC checks completed satisfactorily.
1233	T-230	Tel-2 will be radiating at 960 mc for about 30 minutes (will have to be off when we come on with the spacecraft).
1240	T-223	"Red-Box" no-voltage checks completed satisfactorily.
1243	T-220	Trouble with circuit GT 131-69 from here to Pasadena. May be caused by bad repeater in AE Communications Center.
1244	T-219	Agena destruct checks completed.
1252	T-211	Spacecraft power ON.
1254	T-209	131-69 OK now. Repeaters OK. Experiencing bad cross talk on Channel 11.
1318	T-185	T-6-Hour Weather Report - GO Bending Moment: 48% Usable Control: 40% Total Effect: 67%
1356	T-147	Agena UDMH 10% tanking completed. Starting 100% UDMH tanking.

VI LAUNCH COUNTDOWN LOG (Cont'd)

TIME		EVENT
GMT	T-TIME	
1404	T-139	Results of first loop test - NO GO - will re-run; incorrect designate setting.
1408	T-135	100% Agena UDMH fuel tanking completed.
1418	T-125	Re-run of Loop Test - GO.
1428	T-115	Surface wind velocities: 30' above surface: 15 mph steady, gusts to 21 mph 90' above surface: 18 mph steady, gusts to 21 mph All Spacecraft systems - GO.
1437	T-106	Service tower (gantry) removed from vehicle to maintenance area.
1453	T-90	Spacecraft frequencies: A. 960.043341 at 1443Z B. 890.045100 at 1439Z C. 960.048649 at 1441Z Case II Temperature - 75°F at 1441Z
1456	T-87	10% Agena acid tanking complete.
1506	T-77	Surface wind velocities: 30' above surface: 18 mph steady, gusts to 24 mph 90' above surface: 18 mph steady, gusts to 24 mph
1513	T-70	100% Agena acid tanking complete.
1523	T-60	All Spacecraft systems - GO. Start BIH, expect 10-minute duration.
1533	T-60	Resume count.

VI LAUNCH COUNTDOWN LOG (Cont'd)

TIME		EVENT
GMT	T-TIME	
1537	T-56	T-3-Hour Weather Report - GO Bending Moment: 61% Usable Control: 44% Total Effect: 69%
1543	T-50	Surface wind velocities: 90' above surface: 30 mph steady, gusts to 34 mph
1549	T-44	Quick Look analysis of second Loop Test is GO.
1550	T-43	4101 computer on TFV now "green".
1553	T-40	Spacecraft frequencies: A. 960.043337 at 1541Z B. 890.044950 at 1534Z C. 960.048525 at 1539Z D. 890.044800 at 1546Z E. Plus 0.06 volts at 1545Z Case II Temperature - 75.5°F at 1531Z
1558	T-35	Results of second Loop Test - GO. Holding start of LOX tanking because of weather (wind velocity).
1608	T-25	HOLD - expected duration - 10 minutes. Holding because of marginal wind velocity.
1609	T-25	TFV data garbling badly.
1610	T-25	TFV data back in - garbling caused by trying to use 4101 computer - apparently computer still out. Surface wind velocity: 30 mph steady, gusts to 36 mph
1618	T-25	Hold extended 10 minutes.
1622	T-25	Starting LOX tanking.

VI LAUNCH COUNTDOWN LOG (Cont'd)

TIME		EVENT
GMT	T-TIME	
		30 miles per hour is criteria for start of LOXING - after consultation with West Coast, this was revised to 40 miles per hour - maximum for launch is 54 miles per hour.
1629	T-25	Resume count. C-Band - GO Azusa - GO
1642	T-12	Case II Temperature 76°F. at 1638Z Rate 4-9 sync pulse end: 291d. 16h 31m 50s Zulu
1649	T-5	Start BIH Launch Plan 18C Spacecraft - GO Vehicle - GO Range - GO
1654	T-5	Resume count.
1659	T-0	LIFTOFF!
	L+180s	DSIF-0 reports -85 dbm and solid.
	L+220s	DSIF-0 reports telemetry in lock at -95 dbm.
1708		DSIF-0 lost lock at 1706:55Z.
1731		DSIF reports that DSIF-1 acquired two-way lock at 1729:28Z
1734		DSIF reports that DSIF-5 acquired at 1732:00Z.
1739		DSIF-1 lost track at 1737:07Z.
1747		DSIF reports that DSIF-4 acquired one-way lock at 1745Z. SRO reports that TFV lost signal at approximately L+2809s.

TABLE VI. SEQUENCE OF LAUNCH EVENTS

RATE 4-9 SYNC PULSE END 16 HR. 31 MIN. 50 SEC.

LIFTOFF: 16 HR. 59 MIN. 07.756 SEC.

	MARK#		ZULU TIME		NOMINAL	ACTUAL
	1	L+	1701	24.55	139.0	136.79
Tel 2	2	L+	1701	27.40	141.0	139.64
↓	3	L+	1703	40.75	277.8	272.99
	4	L+	1703	56.4	294.5	288.64
	5	L+	1703	57.95	296.0	290.19
JPL	6	L+	1704	01.1	299.0	293.34
	7	L+	1704	47.92	347.5	340.16
DR STA	8	L+	1707	20.9	501.16	493.14
↓	9	L+	1733	18	2050.0	2050.24
	10	L+	1734	48	2140.3	2140.24
SRO						
↓	11	L+	1737	20.7	2292.0	2292.94
	12	L+	1737	25.5	2297.0	2297.74
JPL	13	L+	1743	54.8	2687.0	2687.04